Health & Safety Report

Worker Health and Safety Branch

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Evaluation of Pesticide Episode Investigation Reports, 1999-2001

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Abstract

The Department of Pesticide Regulation (DPR) maintains a Pesticide Illness Surveillance Program (PISP). The local county agricultural commissioners' (CAC) staff investigates each pesticide exposure identified in the state and submits those investigative reports (Pesticide Episode Investigative Reports, PEIR) to the DPR Worker Health and Safety Branch (WH&S). The data collected during pesticide illness investigations are used to evaluate the pesticide regulatory program.

The objective of this project is to identify, from an occupational safety viewpoint, strengths and weaknesses of the investigative procedures and reports. The study results will identify areas to focus investigator training and improvements in the investigative process.

WH&S scientists reviewed investigative reports from illness or injury episodes potentially related to the use of agricultural pesticides. The evaluations focused on how well the investigative reports documented the information the investigators collected (or were unable to collect). This review was based solely on the information provided in the county agricultural commissioners' investigative reports and assessed the quality of the information presented in those reports. In addition, WH&S evaluated the lag time between exposure and when county investigators are notified of the incident and the influence on the ability of the investigator to do their job.

Under a grant from the US Environmental Protection Agency, WH&S scientists reviewed 376 agricultural use related investigative reports from 209 separate exposure episodes investigated in 1999-2001. Overall, it appears that the information reported by county investigators is adequate to enable trained scientists to at least make an educated guess as to the circumstances of the exposure event. Investigative reports contained complete descriptions of required information for a little over 60% of the cases. However, required data was either missing or very minimal in 18.5% of the cases, with the remainder falling in between.

County notification time ranged from 1 to 525 days, with an average of 44 days. Generally, notification via workers' compensation reports took longer than via physician reporting; notification averaged 61 and 26 days, respectively. Analysis showed no correlation between the notification lag time and the average score calculated for each investigative report.

In order to evaluate the pesticide regulatory program, complete and detailed information is essential. Much of the information missing in the investigative reports pertains to occupational safety issues. Without details on exposure, work history, activity at the time of exposure, pesticide-handling equipment, clothing worn and protective equipment used, and on how the pesticide was handled (e.g., cut open water soluble packaging, closed system etc.) we cannot determine the impact of the current regulatory requirements.

DPR has initiated the development of focused training that emphasizes the importance of collecting detailed and complete information from an occupational safety perspective and improving the notification process for illness episodes.

Introduction

The Department of Pesticide Regulation (DPR) maintains a Pesticide Illness Surveillance Program (PISP). Pesticide exposure episodes are identified through physician reports (required by law and from the worker's compensation program). The local county agricultural commissioners' (CAC) staff investigates each pesticide exposure identified in the state and submits those investigative reports (Pesticide Episode Investigative Reports, PEIR) through the DPR Enforcement Branch to the Worker Health and Safety Branch (WH&S). WH&S scientists evaluate and code information contained in the PEIRs. (The data elements coded can be found in Appendix A.) The data collected during pesticide illness investigations is used to evaluate the pesticide regulatory program.

Through the DPR's Enforcement Initiative process, WH&S identified potential deficiencies in the pesticide episode investigation process and reports[1/]. DPR's Pesticide Enforcement Branch provides guidance and technical support to CACs conducting investigations. Thus, the county staff is thoroughly trained in investigating and documenting the findings as they relate to violations of California laws and regulations. WH&S in cooperation with Pesticide Enforcement Branch developed the Pesticide Episode Investigation Procedures Manual[2/] for use by the county investigators. Frequently, however, the activities and actions that lead to the pesticide exposure are not fully documented in the investigative report for a variety of reasons. When this happens, WH&S cannot determine what led to the exposure and how it might be prevented in the future.

The U.S. Environmental Protection Agency (US EPA) sponsored an enforcement and occupational safety evaluation of the PEIR. This report documents the findings of the occupational safety evaluation. (The enforcement evaluation is documented in a separate report.)

Objective

The objective of this project is to identify, from an occupational safety viewpoint, strengths and weaknesses of the investigative procedures and reports. Evaluations will focus on the completeness of evidence collection, occupational safety information, interviewing techniques, and report writing. The study results will focus investigator training and improvements in the investigative process.

Methods

Under a grant from the US EPA, WH&S scientists proposed to evaluate investigative reports from approximately 300 illness or injury episodes potentially related to the use of agricultural pesticides[a]. Generally, investigative reports were reviewed as WH&S received them. In order to reach the goal of 300 reviews, we also reviewed some 1999 cases. The review did not include illness following exposure to non-agricultural use pesticides (e.g., those used in buildings, warehouses, etc.). This review did not evaluate the accuracy of the data collected and did not consider information that was collected and not reported. This review was based solely on the information provided in the county agricultural commissioners' investigative reports and assessed the quality of the information presented in those reports.

[a] Agricultural use pesticides are those intended to contribute to the production of agricultural commodities.

Criteria for evaluation of the PEIRs were derived from the requirements in the Pesticide Episode Investigation Procedures Manual[2/]. The evaluation criteria included items such as spray history, work history, exposure episode, hospitalization and disability status, and documentation of the interviews conducted as part of the investigation. As part of the process, scientists evaluated the degree to which the information was documented in the investigative report. A scoring system was developed to aid in the evaluation and subsequent data analysis. The scoring for the various evaluation criteria varied. Evaluation criteria that required only a "Yes" or "No" answer (e.g., documentation of age, hospitalization status) were given the score of 3 and 0, respectively. In some instances, the investigators are unable to collect the information. For investigations where investigators documented their attempts and the attempts seemed credible, the lack of data was not included in the analyses. Other criteria required a qualitative response (i.e., spray history, work history) and were given the following scores: 3 – complete; 2 – adequate; 1 – minimal; 0 – missing. When the criteria were not applicable to the particular investigative report a score of -1 was assigned. Adequate information allows evaluators to determine what happened on the day of exposure. Detailed information includes data from an appropriate period of time to allow evaluation of the possible effects of other exposures. For example, if we are told that an applicator sprayed diazinon on the day he became ill, that would be considered adequate information. However, in order to evaluate the potential effects of other organophosphates, information is needed on the pesticides handled for the previous 2-4 months. The complete list of evaluation criteria, scoring and definitions can be found in Appendix B. A Microsoft Access® database was developed to record the evaluations.

Data analysis consisted of basic descriptive statistics and was conducted in Microsoft Access® and Microsoft Excel®. Distributions for spray history, cultural practice, equipment, and supervisor interview were performed by episode rather than by case. [An episode is described as one exposure event and may involve one or many people. Case is used to define each person involved in an episode.] For episodes involving more than one person, those four parameters would be the same for all involved in the episode. The reported distributions excluded cases where the criteria were not applicable to the specific episode or case. For example, data on cultural practices may not be applicable to exposure of an aerial applicator. Averages reported are weighted averages based on the number of cases (or episodes when appropriate) applicable to the particular criterion.

In addition, WH&S evaluated the elapsed time between exposure and notification of county investigators and the effect this delay has on the ability of the investigator to do his/her job. In the PISP database, we record the date of injury (exposure), and the date the workers' compensation record or physician reporting document is received. Using these dates, we can estimate the approximate time the county investigators are notified and evaluate the effect of the notification lag on the quality of the investigative report. We used regression analysis to evaluate the correlation between notification lag time and the average score for each investigative report. Ten reports were removed from this analysis, as we did not have data on the notification timing.

Results

Worker Health & Safety Branch scientists reviewed 376 agricultural use-related investigative reports from 209 separate exposure episodes investigated in 1999-2001. These investigative reports included 101 cases from 63 episodes in 1999, 270 cases from 142 episodes in 2000 and 5 cases from 4 episodes in 2001. Scientists evaluated investigations of agricultural episodes from 38 different counties (Table 1).

The investigation evaluation covered a good cross-section of the agricultural counties in California. Investigations from all counties in the heavily agricultural San Joaquin and Sacramento Valleys were included. The review also included investigations from counties in the north, central and south coast areas, as well as the southern desert.

Table 1: Cases and Episodes Evaluated during the Pesticide Episode Investigation Report Review[a/]

County	Number of Cases[b/]	Number of Episodes[c/]	County	Number of Cases[b/]	Number of Episodes[c/]
Alameda	1	1	Orange	4	3
Amador	1	1	Riverside	3	3
Butte	2	2	Sacramento	1	1
Colusa	1	1	San Diego	3	3
Fresno	44	31	San Joaquin	13	12
Glenn	5	4	San Luis Obispo	1	1
Humboldt	2	2	San Mateo	2	2
Imperial	7	6	Santa Barbara	5	4
Kern	23	16	Santa Clara	1	1
Kings	7	7	Santa Cruz	2	2
Lake	1	1	Solano	9	2
Lassen	2	1	Sonoma	11	11
Madera	40	8	Stanislaus	21	18
Marin	1	1	Sutter	2	2
Mendocino	2	2	Tehama	1	1
Merced	12	7	Tulare	36	18
Monterey	95	20	Ventura	3	3
Napa	4	4	Yolo	5	3
Nevada	1	1	Yuba	2	2

[a/] Investigation reports from pesticide-related agricultural illnesses or injuries were reviewed for 1999, 2000 and few 2001 episodes.
[b/] The number of people involved in pesticide exposure investigations.
[c/] The number of exposure events investigated; an exposure event may involve more than one case.

Table 2 gives the statewide distributions for all the criteria evaluated. Overall, it appears that the information reported by county investigators is adequate to enable trained scientists to at least make an educated guess as to the circumstances of the exposure event. Investigative reports contained complete and/or required information (weighted average of "complete" and "yes" responses) 63% of time. For criteria with qualitative responses, on average investigators

Table 2: Statewide Distribution of Information Provided in Pesticide Episode Investigation Reports, 1999-2001

Review Criteria	Information Provided[a/]						
	Yes	Not Available	No	Complete	Adequate	Minimal	Missing
Age/Medical Information							
Age	97.1%		2.9%				
Hospitalization	95.5%	0.3%	4.3%				
Disability	91.5%	1.3%	7.2%				
Medical Records	70.7%	7.3%	22.0%				
Medical Description				39.1%	51.7%	8.8%	0.3%
Exposure/Symptom/Medical Care Time Line				57.8%	30.1%	11.3%	0.8%
General Episode Information							
Activity				67.6%	29.8%	2.7%	0%
Work History				35.6%	41.0%	19.1%	4.3%
Spray History[b]				53.1%	36.7%	4.8%	5.4%
Exposure				41.2%	48.4%	7.7%	2.7%
Cultural Practice[b]				36.1%	50.9%	12.0%	0.9%
Equipment[b]				58.6%	30.9%	4.7%	5.8%
Protective Measures Used							
Eye Protection	66.8%	2.1%	31.1%				
Hand Protection	76.6%	2.1%	21.3%				
Respiratory Protection	73.4%	2.1%	24.5%				
Engineering Controls	68.1%	2.1%	29.8%				
Other Protective Equipment	75.3%	1.9%	22.9%				
Interview Information							
Employer/Supervisor Interview[b]	79.2%	5.6%	15.2%				
Employee Interview	84.6%	10.2%	5.2%				
Translator Used	30.4%	8.0%	61.6%				
Appropriate Translator Used	68.0%	15.5%	16.5%				
Employer NOT Present During Employee Interview	48.7%	42.1%	9.2%				
Others NOT Present During Employee Interview	27.7%	45.6%	26.7%				
Interview Coworkers	58.6%	2.4%	39.0%				
Interview Applicators	66.8%	0.4%	32.8%				
Overall Average	69.9%	8.8%	21.9%	48.6%	39.9%	8.9%	2.5%

[a] Not all responses apply to each specific criterion. Some criteria required a yes/no response while others required a qualitative judgement of the adequacy of the information supplied. Appendix B provides definitions of the various criteria and the review responses.

[b] Distribution based on episodes, not individual cases

included complete information nearly 49% of the time. For criteria with "yes/no" responses, investigators reported the required information for nearly 70% of the cases. However, required data were either missing or very minimal for 18.5% of the criteria (weighted average of the "no", "missing" and "minimal" evaluations from Table 2). The remainder fell into the categories of not available (and documentation demonstrated that fact) and "adequate". Adequate information provides reviewers enough information to make an educated guess as to what happened, however, few details are provided. For example, the investigative report may state that a worker splashed pesticide "X" on him while mixing and loading and became ill as a result. The investigator did not document the protective equipment used, how the pesticide happened to splash on the worker, how decontamination was accomplished, etc. Thus we can find enough information to fill in the fields in the surveillance database, but are lacking enough information to impact the worker safety regulations.

Age/Medical Information

Investigators did an excellent job reporting information on age, hospitalization and disability status, and number of days hospitalized or off work. This high level of data collection occurred generally for all counties. Counties are requested to collect medical records on all cases that meet priority episode criteria[b] as well as other selected cases. Medical records were obtained for nearly 71% of the cases for which it is required; for 7% the records were not available (either a release could not be obtained or the physician refused to release the records).

However, the information reported is much less complete for the medical description of the signs and symptoms experienced and a discussion of the time line from exposure to symptom onset to receipt of medical care. Investigators are asked to obtain a list of symptoms from all exposed persons even though some symptoms are listed on the workers' compensation record or the required physician's report. Frequently, symptoms listed in these two documents are inaccurate.

General Episode Information

Complete episode information (detailed work activity at time of exposure, work history, spray history, exposure information, field cultural practices and equipment) was presented in an average of 49% of the investigative reports. Episode information was missing or very minimal in nearly 11% of the investigative reports reviewed.

All investigative reports generally provided good information on affected individual's activity on the day of the event, but typically did not make detailed inquiries into past activities. A similar pattern was noted for reporting of detailed information on spray history and the equipment used.

Protective Measures Used by the Exposed Person

County investigators are asked to collect information on the type of eye, hand, respiratory and other protection used at the time of exposure as well as information about the use of engineering controls. On average, the information is included in 72% of the investigative reports. Investigators attempted to collect the information but it was not available (and that attempt was documented) in 2% of the reports. However, in 26% of the reports this data was not presented.

[b] Priority criteria generally indicate a fairly severe episode and involve fatality, hospitalization, or 5 or more people involved in a single episode.

Interview Information
The employer/supervisor and employee (usually the exposed person) were interviewed in more that 80% of the investigations. During the employee interview, the employer or supervisor was known to be present nearly 48% of the time, while others were known to be present during 28% of the employee interviews. Poor documentation was noted concerning the presence or absence of the employer or others during employee interviews.

Table 3 lists the locations where the employee interviews were conducted. In many cases (99) the investigator did not document the location of the employee interviews. The 44 cases for which no employee interview took place was most often because the investigator could not locate them. Generally, employees should not be interviewed at the employer's headquarters and interviews at the work site are questionable, depending on how the interview is handled.

Table 3: Location of Employee Interviews Conducted during a Pesticide Episode Investigation, 1999-2001

Interview Location	Number Interviews
County Agricultural Commissioner's office	4
Employer headquarters	10
Employee's residence	21
Hospital/clinic	66
Telephone/FAX	11
Work site	121
Unknown	99
None	44

Notification of Episodes
Because the majority of the cases are identified through the workers' compensation system, the counties are often notified long after an exposure occurred. This can severely hamper their investigative efforts (people forget details, workers have moved on to other employment, etc.). WH&S also evaluated the time from the date of exposure to notification of the county via the two mechanisms used most often (workers' compensation reports and physician reporting). County notification time ranged from 525 days to 1 day, with an average of 44 days. Generally, notification via workers' compensation reports took longer than via physician reporting; notification averaged 61 and 26 days, respectively. However, in three counties (Monterey, Orange, and Santa Barbara) notification via physician reporting took longer (Table 4). Regression analysis of notification time versus average score for the investigative report showed no correlation (r^2=0.003). However, we do not know if earlier notification meant the investigation started sooner as this data is not available.

Table 4: Pesticide-Related Illness Episode Notification by County, 1999-2001

County	Total Number of Episodes[a]	County[b] Notification (days)	Workers' Compensation[c] Notification (days)	Physician Reporting[d] Notification (days)
Alameda	1	39	39	not applicable
Amador	1	82	82	not applicable
Butte	2	72	72	not applicable
Colusa	1	41	41	not applicable
Fresno	31	41	76	22
Glenn	4	24	36	1
Humboldt	2	25	42	7
Imperial	6	26	43	17
Kern	16	16	26	11
Kings	7	48	61	22
Lake	1	5	not applicable	5
Lassen	1	110	110	not applicable
Madera	8	14	14	14
Marin	1	68	68	not applicable
Mendocino	2	56	not applicable	56
Merced	7	39	63	14
Monterey	20	130	119	146
Napa	4	24	25	22
Nevada	1	6	not applicable	6
Orange	3	37	35	40
Riverside	3	28	35	15
Sacramento	1	14	14	not applicable
San Diego	3	23	39	6
San Joaquin	12	23	36	11
San Luis Obispo	1	27	27	not applicable
San Mateo	2	65	65	not applicable
Santa Barbara	4	25	22	26
Santa Clara	1	7	not applicable	7
Santa Cruz	2	118	118	not applicable
Solano	2	51	89	12
Sonoma	11	47	58	21
Stanislaus	18	24	38	10
Sutter	2	19	30	8
Tehama	1	223	223	not applicable
Tulare	18	41	75	13
Ventura	3	87	87	not applicable
Yolo	4	23	27	11
Yuba	2	38	38	not applicable
Grand Average	209	**44**	**61**	**26**

[a] The number of agricultural exposure events investigated; an exposure event may involve more than one case.
[b] Average notification time for all agricultural episodes reported for the county
[c] Average notification for all agricultural episodes reported via workers' compensation reports
[d] Average notification for all agricultural episodes reported via physician reporting

Discussion

The data collected during pesticide illness investigations impacts the pesticide regulatory program. Therefore, it is imperative to collect accurate and detailed information during each episode investigation. The standard necessary for the regulatory program is complete and detailed occupational safety information.

Our ultimate goal is to eliminate illness or injury related to pesticide exposure. Summaries of the California pesticide illness surveillance data suggest that, with the exception of 1999, reports of illness related to pesticides have generally been declining[3,4,5,6]. However, we still have over 1000 episodes reported in California every year many of which are not related to a violation of existing pesticide laws and regulations. PISP scientists frequently see investigation reports where exposure occurred, but no violations of laws or regulations were documented. In addition, complete documentation is often not provided on how that exposure happened. If a person handling pesticides becomes ill or injured as a result of pesticide exposure, it is imperative that WH&S have detailed information describing exactly what happened.

Complete and detailed information is essential if this data is to be used to assess the pesticide regulatory program. As noted above, complete or required information ("complete" or "yes") is collected about 63% of the time. That percentage, although encouraging, is not adequate for WH&S to evaluate the pesticide regulatory program. Much of the information WH&S considers missing pertains to occupational safety issues. Often, enough information is presented in the investigative reports to allow trained scientists to make at least an educated guess as to how the exposure occurred. However, without <u>details</u> on exposure, work history, activity at the time of exposure, clothing worn and protective equipment used, scientists cannot completely evaluate the exposure scenario. Without the details on how the pesticide was handled (i.e., cut open water soluble packaging, properly used protective clothing, exact spray or mixing equipment used, etc.) we cannot determine the adequacy of the current regulatory requirements.

Worker Health and Safety investigations into selected episodes have uncovered some of these missing details, such as leaving the lid open on a mix or nurse tank, specific work activities or habits that lead to exposure, workers exposed to residue on duff under the trees[7], workers exposed to cyhalothrin (not registered) while harvesting raisin grapes[8] and higher than expected residues[9]. Admittedly, much of the information collected in some WH&S investigations was available because we received early notification of the exposure. We recognize that investigations can be hampered because of the delay in notification about the episode. Investigators were notified about episodes within seven days of the episode only 20% of the time. However, for early notification to be effective, investigators must start the investigation as soon as they receive notice. We also realize that because fines and employee discipline may result from these investigations, the investigators may not get the whole truth about the episode.

Investigations need to be expanded from strictly an enforcement evaluation of the episode. In one episode, field workers were exposed to carbofuran while weeding a cotton field. The exposures occurred because of an early reentry violation; workers were allowed to work in the field a few hours after the application instead of the required 24 hours. During the interviews, investigators asked all the appropriate questions to determine if violations had occurred. They

asked if long-handled hoes were provided; all workers responded positively. However, a few workers also told investigators that they didn't actually use the hoes because the weeds were very tall and easier to pull by hand[10]. Pulling weeds by hand greatly increases the worker's exposure to the high residues in the field. The investigators did not follow up on this issue and determine how such massive exposure occurred. This piece of information helps explain why some were so violently ill and can help employers focus on issues that can reduce exposure.

Information on the protective measures used and clothing worn at the time of exposure is extremely important. DPR considers it so important that a significant portion of the first page of the investigative form contains check boxes to make it easy to provide the necessary information. Yet, we still receive no data on protective measures 26% of the time. Without this type of information we cannot begin to evaluate how exposure really occurred.

To get the entire picture, investigators should interview all involved (exposed person, employer (if applicable), applicator, witnesses, coworkers, etc.). It is important to ensure that the interview takes place in a location that is comfortable for the interviewee. Interviews should not be held with the employer or foreman present. It is also important to interview non-English speaking people in their native language. Ideally, the translators should be impartial and a member of the investigative staff. However, given the limited resources of the investigators, translation services should never be provided by the employer, foreman or other non-farm worker employed by the worker's employer. These measures allow the employee to tell their side of the story without fear of retaliation.

Reporting of incidents continues to be a problem. DPR still relies primarily on workers' compensation reports to identify pesticide-related cases. Cases reported in this manner are often received 2-3 months (or more) after the exposure incident. Although there was no correlation between the investigation content and the notification time, earlier notification should result in an earlier start on the investigation. Thus more information should be available, as memory of the incident is still fresh, employees are still available for interview, etc.

Recommendations

This review suggests some areas for focused training of DPR and CAC staff; those include:

- Ensure investigations focus on the details of exposure.
- Emphasize the importance of collecting information on the exact protections used and clothing worn at the time of exposure.
- Develop specific training for counties that need improvement in their investigative reports.
- Stress the importance of making sure the person being interviewed is comfortable (setting, the language spoken, etc.) so they will feel free to tell the investigator exactly what happened.

[DPR has initiated the development of focused training that will include the above points.]

The DPR enforcement initiative contains recommendations that are consistent with the findings of this report[1]. Those include:

- DPR should conduct more detailed county evaluations.

- Investigate all pesticide-related illnesses sufficiently to determine if mitigation measures are needed.
- Enhance recruitment and hiring of bilingual inspectors.
- Study costs to make sure translators are available to CAC staff during investigations.
- Ensure all relevant parties are interviewed during and illness investigation and conduct interviews in a safe location to prevent retaliation.

[The focused training will address many of the points in the Enforcement Initiative.]

In addition, WH&S needs to continue to evaluate methods to improve physician reporting and early notification of illness episodes. WH&S is currently contracting with the California Poison Control System (CPCS) to evaluate the capability of CPCS to report pesticide-related illnesses for physicians. Pilot projects with CPCS have shown that notification can be very rapid.

References

1. Department of Pesticide Regulation, 1999. Enforcement Initiative: Proposals to Improve Enforcement of California's Pesticide Regulatory Program. California Environmental Protection Agency, Department of Pesticide Regulation http://www.cdpr.ca.gov/dprenfinit.pdf, accessed May 10, 2001. 60 pgs.

2. Department of Pesticide Regulation, 2000. Pesticide Episode Investigation Procedures Manual. Pesticide Enforcement Branch & Worker Health and Safety Branch. 55 pgs.

3. Department of Pesticide Regulation, 1999. Overview of Results from the California Pesticide Illness Surveillance Program, 1996. California Environmental Protection Agency, Department of Pesticide Regulation, Worker Health and Safety Branch. Report # HS-1776. (can be found at http://www.cdpr.ca.gov/docs/whs/pdf/hs1776.pdf).

4. Department of Pesticide Regulation, 2000a. Overview of Results from the California Pesticide Illness Surveillance Program, 1997. California Environmental Protection Agency, Department of Pesticide Regulation, Worker Health and Safety Branch. Report # HS-1783. (can be found at http://www.cdpr.ca.gov/docs/whs/pdf/hs1783.pdf)

5. Department of Pesticide Regulation, 2000b. Summary of Results from the California Pesticide Illness Surveillance Program, 1998. California Environmental Protection Agency, Department of Pesticide Regulation, Worker Health and Safety Branch. Report # HS-1795. (can be found at http://www.cdpr.ca.gov/docs/whs/pdf/hs1795.pdf)

6. Department of Pesticide Regulation, 2001. Summary of Results from the California Pesticide Illness Surveillance Program, 1999. California Environmental Protection Agency, Department of Pesticide Regulation, Worker Health and Safety Branch. Report # HS-1811. (can be found at http://www.cdpr.ca.gov/docs/whs/pdf/hs1811.pdf)

7. Maddy, K. C. Smith, Y. Brittain, S. Fredrickson, 1985. Summary of Field Activities Following Exposure to Parathion/Paraoxon Residues and Illness of Grapefruit Harvest

Employees in Tulare County in July 1985. California Environmental Protection Agency, Department of Pesticide Regulation, Worker Health and Safety Branch. Report # HS-1339. (can be found at http://www.cdpr.ca.gov/docs/whs/pdf/hs1339.pdf)

8. Spencer, J., 2000. Branch Activities and Results of Analyses from Our Involvement in the Investigation of 44-FRE-99 (Project 9904). Memorandum to Susan Edmiston, DPR, dated November 14. California Environmental Protection Agency, Department of Pesticide Regulation, Worker Health and Safety Branch. Report # HSM-00008.

9. O'Malley, M., C. Smith, L. O'Connell, M. Ibarra, I. Acosta, S. Margetich, and R. Krieger, 1991. Illness among Grape Girdlers Associated with Dermal Exposure to Methomyl. California Environmental Protection Agency, Department of Pesticide Regulation, Worker Health and Safety Branch. Report # HS-1604. (can be found at http://www.cdpr.ca.gov/docs/whs/pdf/hs1604.pdf)

10. Edmiston, S., F. Schneider, B. Hernandez, A.S. Fredrickson, V. Quan, 1999. Exposure and Illness Following Early Reentry into a Carbofuran-Treated Field. California Environmental Protection Agency, Department of Pesticide Regulation, Worker Health and Safety Branch. Report # HS-1779. (can be found at http://www.cdpr.ca.gov/docs/whs/pdf/hs1779.pdf)

Appendix A

List of data fields for the Pesticide Illness Surveillance Program database

Injured's name (plus other identifying information), sex, age
Date of injury
County where the injury occurred
Employer name
Standard Industrial Classification code
Dates the various documents are received by WH&S
Data sufficiency – Is the data provided adequate to make judgement on the relationship to pesticide exposure?
Relationship – The relationship of the exposure event to the signs and symptoms experienced.
Agricultural/Non-agricultural – Was the pesticide used or intended for agricultural or non-agricultural use?
Occupational/Non-occupational – Did the exposure occur while the injured person was working?
Activity (work history) – Description of what the person was doing at the time of exposure
Exposure – Characterization of how an individual came in contact with a pesticide
Equipment – How was the pesticide applied?
Episode setting – Location where the episode occurred
Number of days hospitalized
Number of days off work or missing normal activity (e.g., school)
Type of illness - Categorization of the type of symptoms experienced.
Illness characteristic - Characteristics of the symptoms (i.e., fatal, chronic, allergic)
Physician's name
Type of medical facility
Signs and symptoms experienced
Physician's diagnosis
Pesticide(s) involved along with the USEPA registration number, formulation and toxicity category (spray history)
Pesticide application date
Pesticide application site
Measures taken to protect the eyes, hands, respiratory tract and the rest of the body.
Were engineering controls used?
Exposure circumstances - Employment circumstances of individuals involved in the exposure (e.g., self-employed, structural pest control operator, etc.).
Contributory factors – These are other factors that contributed to the episode (i.e., odor from the application, equipment failure)
Predisposition - A condition that makes the affected individual unusually susceptible to adverse effects from exposure to pesticides (i.e., asthma, allergy, previous episode).
Violations of laws and regulations noted

Appendix B

WH&S PEIR Review Criteria

Category	Criteria	Comments
WH&S Case #		WH&S case number
County		County where the exposure occurred
Date of Injury		
Date of completed investigation report		Enter date of completed PEIR.
Completed in 120 days	Yes/No	If extension requested, include that information in the comment field.
Group Episode	Yes/No	Was this case part of a group episode?
Activity	4 point scale[a]	Specific activity at time of exposure. General terms such as laborer, field worker, etc. are not specific.
Work History	4 point scale[a]	Need to judge the completeness of the information. Often the last activity or the last application is not complete data.
Spray History	4 point scale[a]	
Exposure	4 point scale[a]	Need to judge the completeness of the information on how exposure occurred.
Cultural Practices	4 point scale[a]	Cultural practices include the condition of the field (weedy, etc.), type of trellising or pruning, etc. Need to judge the completeness of the information.
Equipment	4 point scale[a]	Need to judge the completeness of the information provided. If very detailed and specific equipment is provided, use "specific".
Age (listed)	Yes/No/Not available[b]	
Hospitalization	Yes/No/Not available[b]	Need data to determine the length of hospitalization, if any
Disability	Yes/No/Not available[b]	Need data to determine the length of disability, if any
Medical Records	Yes/No/Not available/Not applicable[c]	Were medical records obtained? Only required for priority investigations.
Medical Description	4-point scale[a]	Description of signs and symptoms following exposure
Exposure/symptom/ medical care time line	4 point scale[a]	Length of time between exposure and development of symptoms; and length of time between symptom development and medical attention.
Protective Measures		Did the investigator determine the need for and use of the various protective measures?
Eye	Yes/No/Not available[d]	
Hand	Yes/No/Not available[d]	
Respiratory	Yes/No/Not available[d]	
Engineering controls	Yes/No/Not available[d]	
Other	Yes/No/Not available[d]	
Interviews		
Employer/Supervisor	Yes/No/Unknown/Not Applicable[e]	Was employer/supervisor interviewed?
Employee	Yes/No/Unknown/Not Applicable[e]	Was employee interviewed?
Translator	Yes/No/Unknown/Not Applicable[e]	Was a translator needed and used?
Appropriate translator?	Yes/No/Unknown/Not Applicable[e]	Was an appropriate person used as a translator? (not the supervisor, employer)
Employer/foreman present?	Yes/No/Unknown/Not applicable[f]	Was the employer or supervisor present during the employee interview?

Category	Criteria	Comments
Others present?	Yes/No/Unknown/ Not applicable[f]	
Interview Others		
Co-workers	Yes/No/Unknown/Not applicable[f]	
Applicator	Yes/No/Unknown/Not applicable[f]	
Interview location	Not scored	Site of employee interview listed
Comments		Any comments needed to clarify answers.

[a] 4-point scale:
Complete (3 points) – All information needed to fully evaluate the field was collected and adequately presented.
Adequate (2 points) – Enough information was provided to allow evaluation; some more data would be useful for a complete picture.
Minimal (1 point) – The information collected and presented allowed evaluation of the filed provided the reviewer made some possibly unsubstantiated assumptions. Much more data is needed for a clear picture.
Missing (0 points) – Data to allow evaluation of the field was not provided.
Not applicable (-1 point) – This information does not pertain to this particular case.

[b] Age/Hospitalization/Disability
Yes (3 points) – Information to determine age, hospitalization or disability provided
Not available (2 points) – The investigator attempted to collect the information and documented that attempt.
No (0 points) – Information to determine age, hospitalization or disability not provided

[c] Medical Records
Yes (3 points) – Medical records obtained and included in PEIR
Not available (2 points) – Investigator could not obtain releases or the physician refused to turn over records
No (0 points) – Medical records not obtained, but should have been
Not applicable (-1 point) – Records not needed

[d] Protective Measures
Yes (3 points) – The necessary information was provided
Not available (2 points) – After a legitimate attempt, the investigator could not determine the necessary information and documented that attempt.
No (0 points) – The necessary information was not provided

[e] Interviews (employer, employee, translator, appropriate translator, coworkers, applicator)
Yes (3 points) – Interview conducted, appropriate translator used, or others were not present during the interview
Not available (2 points) – The investigator made a legitimate attempt and documented that attempt to conduct the interview or obtain a translator
No (0 points) – Interview not conducted, appropriate translator not used, or others were present during the interview
Not applicable (-1 point) – Field not applicable to the particular case

[f] Interviews (employer present, others present)
No (3 points) – Interview conducted without the employer or other workers present
Not available (2 points) – The investigator did not include information in the investigation on the presence or absence of others during the interview.
Yes (0 points) – Interview conducted, appropriate translator used, or others were present during the interview
Not applicable (-1 point) – Field not applicable to the particular case